

A New Digenetic Trematode, *Gibsonia borealis* sp. n. (Lepocreadiidae: Lepidapedinae), Parasitic in the Rattail *Macrourus berglax* from the Flemish Cap off Newfoundland

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ABSTRACT: *Gibsonia borealis* sp. n. is described from the macrourid fish, *Macrourus berglax* Lacépède, 1802, trawled from depths of 425–521 m in the North Atlantic Ocean east of Newfoundland, Canada. The second species in the genus, it is distinguished from the type species by its longer excretory vesicle, irregularly shaped gonads, long, unipartite external seminal vesicle, and single genital pore with shallow atrium. Affinities of the genus *Gibsonia* are discussed, and the genus is considered a member of the subfamily Lepidapedinae Yamaguti, 1958. The genus is now known to have a bipolar distribution in the Atlantic Ocean above latitudes 46° north and south in rattail fishes of the genus *Macrourus*.

KEY WORDS: Digenea, Lepocreadiidae, *Gibsonia*, fish parasites, taxonomy.

During investigations of the hydrology and fauna of waters contrasting the Flemish Cap with the Grand Bank off Newfoundland, a sample of 18 specimens of *Macrourus berglax* Lacépède, 1802, from Flemish Cap stations yielded 3 new helminth species that were not found in a sample of 28 *M. berglax* from the Grand Bank. Two of the helminth species, a monogenean and a cestode, were described earlier (Campbell et al., 1982). The third species, a lepecreadiid digenetic trematode of the genus *Gibsonia* Gaevskaya and Rodyuk, 1988, is described herein.

Materials and Methods

Fish were collected by Gulf of Mexico shrimp trawl at depths of 425–521 m from the southeastern Grand Bank off Newfoundland and the Flemish Cap. All hosts were moribund or freshly dead when examined. Trematodes from the intestine were observed alive, fixed in AFA at room temperature, and preserved in 70% ethanol. No coverglass pressure was applied during fixation because the worms were well relaxed when discovered. Whole-mount preparations were stained with Mayer's paracarmine and mounted in Canada balsam. Two specimens were embedded in paraffin, serially sectioned at 8–10 μ m, and stained with Harris' hematoxylin and eosin. The fish were identified by Dr. Richard L. Haedrich of Memorial University of Newfoundland. Measurements are in micrometers unless otherwise stated and include the range followed by the mean in parentheses. All measurements are from whole mounted specimens and are expressed as length by width.

Results

Gibsonia borealis sp. n. (Figs. 1–5)

TYPE HOST: *Macrourus berglax* Lacépède (Macrouridae).

LOCALITIES: Flemish Cap: 46°31'N, 45°52'W (2 hosts, 10 worms), depth 425–464 m; 46°43'N, 44°08'W (1 host, 1 worm), depth 514–521 m.

PREVALENCE: 16.6% (3 of 18) from Flemish Cap; 0 of 28 from the Grand Bank; 6.5% (3 of 46) of all *M. berglax* sampled.

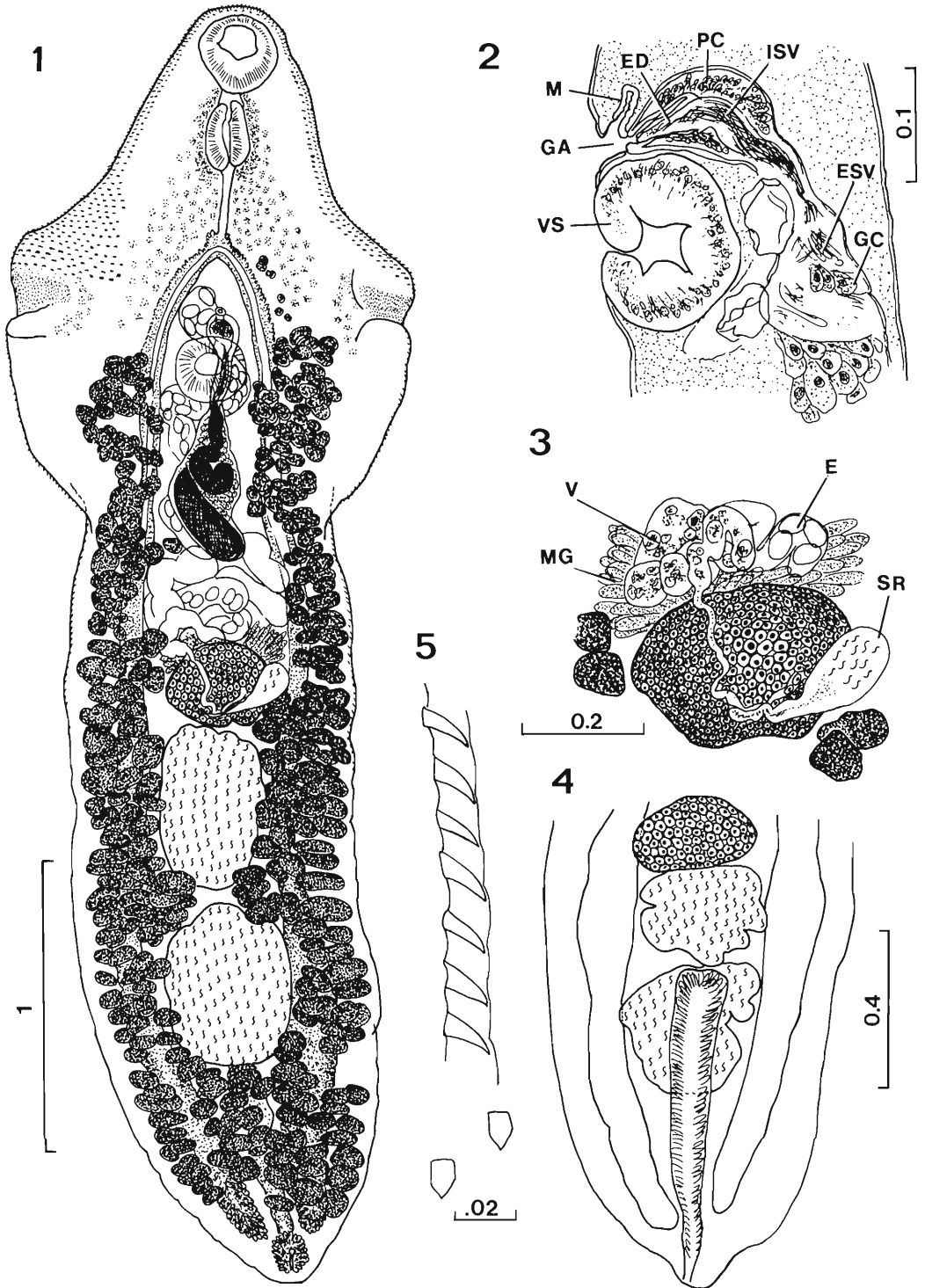
INTENSITY: 1–7 per host.

MEAN INTENSITY: 3.6%.

SPECIMENS: USNM 81927 (holotype), 2 paratypes (USNM 81298); British Museum (NH) 1991, 5.7.1–3 (2 paratypes and sections).

DESCRIPTION (based on 11 specimens): Lepocreadiidae; Lepidapedinae. Body elongate 1.9–4.4 mm long, having a broadly triangular forebody and becoming narrower in the hindbody region posterior to the ventral sucker. Maximum forebody dimensions 920–1900 long by 840–1,340 wide with conspicuous lateral marginal folds 57–220 by 84–277. Margins of forebody capable of assuming a cuplike shape. Hindbody, 880–2,700 by 540–960, tapering posteriorly. Tegument spinose, spines aligned in horizontal rows on forebody, diminishing in number at ovarian level, sparse in posttesticular region. Oral sucker subterminal, 163–272 in diameter, preoral space negligible, oral lobe absent. Prepharynx, 76–136, leading to elongate pharynx, 152–240 by 65–152. Prepharynx and pharynx surrounded by gland cells. Esophagus straight, 106–264 by 19–56, bifurcating about midway between pharynx and ventral sucker. Ceca, 34–160 wide, often with dilatations, gradually enlarging posteriorly, terminating blindly near posterior extremity. Ventral sucker, 144–240, in posterior third of forebody. Sucker ratio 1:0.80–0.96.

Two testes, 156–568 by 228–496, lie in tan-



Figures 1–5. *Gibsonia borealis* sp. n. 1. Holotype, dorsal mount. 2. Sagittal section showing terminal genitalia and genital atrium. 3. Female reproductive organs. 4. Posterior extremity showing extent of excretory vesicle. 5. Tegumental spines. Scale lines are in millimeters. Abbreviations: E, egg; ED, ejaculatory duct; ESV, external seminal vesicle; GA, genital atrium; GC, gland cell; ISV, internal seminal vesicle; M, metraterm; MG, Mehlis' gland; PC, prostatic cells; SR, seminal receptacle; V, vitelline cells; VS, ventral sucker.

dem within intercecal space of middle third of hindbody, separated by small space or not, margins irregularly indented. External seminal vesicle, 179–576 by 76–248, surrounded by gland cells enclosed by delicate membrane, beginning near junction of fore- and hindbody as a distended tube then forming single coil before continuing anteriorly to join cirrus sac. Cirrus sac pyriform, 87–240 by 68–112, median, extending to slightly anterior to ventral sucker, occupied for most of its length by a tube expanded proximally into an internal seminal vesicle surrounded by gland cells and narrowing distally to become short pars prostatica leading to thick walled ejaculatory duct that can be everted into the shallow genital atrium. Genital pore single, immediately preacetabular, median or slightly sinistral.

Ovary, 114–320 by 175–384, directly pretesticular, subspherical to irregular in shape, margin smooth or irregularly indented. Mehli's gland, 336–360 by 240–400, ventral, occupying most of intercecal space over anterior half of ovary. Seminal receptacle elongated, lying posterodorsal to ovary on right side. Laurer's canal not observed. Oviduct originates on posterodorsal surface of ovary and extends anteriorly to Mehli's gland. Uterus entirely preovarian, forming several loose coils in intercecal space, ascending anteriorly above external seminal vesicle, ventral sucker, and cirrus sac; terminating in narrow metraterm entering genital atrium just anterior to cirrus sac. Vitelline follicles large, forming dense lateral bands extending from anterior or posterior level of ventral sucker to posterior extremity; follicles often surround ceca, confluent in post-testicular space, sometimes occupy intertesticular space. Eggs oval, 57–68 (60.8) by 36–42 (38.5), delicate, unembryonated, operculum not observed.

Excretory pore terminal, leading to simple expanded tubular vesicle reaching to posterior margin of anterior testis or ovary.

Discussion

Gibsonia is a monotypic genus created by Gaevskaya and Rodyuk (1988) for *G. hastata* from *Macrurus carinatus* (sic) collected north of the Falkland Islands in the South Atlantic Ocean at a depth of 500 to 650 meters. According to the generic diagnosis, *Gibsonia* differs from other lepecreidiids in possessing a lanceolate body divided into 2 distinctly shaped regions ("fore- and hindbody"), possession of papilla-like structures on the lateral forebody, and large numbers of

gland cells in a thickened body wall in the forebody region. They considered *Gibsonia* most similar to *Lepidapedon* but differentiated from it by the possession of separate genital pores. Only 6.3% of 239 *M. carinatus* examined over several years contained the worms.

Gibsonia borealis sp. n. is the second species in the genus and the first record of a species of the genus in the Northern Hemisphere. Its host is also a member of the genus *Macrurus*, the rough-head grenadier, *M. berglax*. Eleven *G. borealis* were found in 3 of 18 grenadiers from the Flemish Cap off Newfoundland, but none of the 28 fish examined from the Grand Bank contained these trematodes. Evidence of a restricted distribution of this parasite to fish from the Flemish Cap is further supported by Zubchenko (1981; 30 fish) and Houston and Haedrich (1986; 191 fish) who also did not find *G. borealis* in their samples from the Grand Bank. *Gibsonia borealis* may be limited to shallower depths of the Flemish Cap as indicated by its presence in fish taken from 400 to 500 m and its absence in fish taken from 1,200 to 1,400 m. This species serves as 1 among several examples where parasite faunas provide contrast in deep-sea hosts over contiguous geographical regions in the northwest Atlantic (Zubchenko, 1981; Campbell, 1990).

Gibsonia borealis is very similar to *G. hastata* but differs in a number of ways. Spines are present over the entire body of *G. borealis*, but are not present posterior to the level of the anterior testis in *G. hastata*. No lobe was observed in the wall of the oral sucker of *G. borealis*, and the pharynx is about twice as long as wide instead of rounded as in *G. hastata*. The ovary of *G. hastata* is spherical, but the ovary of *G. borealis* varies from subspherical to triangular and is more often asymmetrical with irregular indentations on the posterior margin. The testes of *G. hastata* are described as round or with slightly irregular margins, but testes of *G. borealis* are very irregular and often with deep indentations. The external seminal vesicle of *G. borealis* is more developed, coiled, and extends posterior to the junction of the fore- and hindbody, whereas in *G. hastata* the external seminal vesicle is smaller, bipartite, and does not extend posterior to the junction of the fore- and hindbody. The presence of a single genital pore was confirmed by sections in *G. borealis*, but separate genital pores are described for *G. hastata* (confirmed by personal communication). However, sections of *G. hastata* were not made but should be done because

the possession of separate genital pores is 1 of the few features unique to the genus. There are no papillae in the marginal lapetlike folds of *G. borealis*, and the body spines do not project as figured by Gaevskaya and Rodyuk (1988). Finally, the excretory vesicle extends to the anterior testis or beyond in *G. borealis* but only to the posterior testis in *G. hastata*.

Gibsonia possesses characters that are clearly intermediate between the lepecreadiid subfamilies and raises questions about the characters used to define them. Specimens of *G. borealis* were observed alive and fixed without coverglass pressure, so it can be said with certainty that the forebody margins do not unite posteriorly to form a scoop-shape as in *Diploproctodeum* Park, 1938, and *Caecobiporum* Mamaev, 1970. Serial sections clearly show the absence of ani in *G. borealis*, a feature in agreement with *Diplocreadium*, but unlike *Diplocreadium* the genital pore is preacetabular instead of postacetabular. *Gibsonia* lacks the anterior cecal extensions of *Caecobiporum*, and the esophagus is long like *Diploproctodeum*, not short like other lepecreadiid genera with a laterally expanded forebody (*Diplocreadium* Park, 1939, *Bianium* Stunkard, 1930, and *Caecobiporum*). The ovary is smooth, like *Bianium*, not lobed. Features inconsistent with the genera of the Diploproctodaeinae are forebody shape, the absence of ani, length of esophagus, position of the genital pore, ovarian shape, and extent of vitellaria. Therefore, resemblances of *Gibsonia* to members of the subfamily Diploproctodaeinae Park, 1939, are only superficial.

If body shape was considered of secondary importance, then *Gibsonia* would agree with *Lepidapedon* in all other respects. This is especially true of the male terminal genitalia that Shimazu and Shimura (1984) consider a bipartite cirrus sac and Bray and Gibson (1989) note as an important distinction for the subfamily Lepidapedinae. Except for the laterally expanded forebody, both species of *Gibsonia* strongly resemble *Lepidapedon lebouri* Manter, 1934, from macrourids off the coast of Florida. Furthermore, it should be noted that *L. nicolli* Manter, 1934, is widest anterior to the ventral sucker. Features of *Gibsonia* showing strong affinities to *Lepidapedon* are: the absence of ani or a uroproct; form of the prepharynx, pharynx, esophagus, and ceca; disposition and form of the gonads; distribution of

the vitellaria, preovarian position of the uterus; preacetabular genital pore; presence of a seminal receptacle; an elongated external seminal vesicle with gland cells enclosed by a delicate membranous sac that is apparently continuous with the wall of the cirrus sac; a cirrus sac enclosing an internal seminal vesicle, prostatic cells and short ejaculatory duct; a shallow genital atrium; I-shaped excretory vesicle extending to the anterior testis (see *L. lebouri*, etc.), and macrourid hosts. These common characteristics and hosts indicate a closer relationship to *Lepidapedon* and the Lepidapedinae Yamaguti, 1958, than to the Diploproctodaeinae.

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